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10/815,097	03/31/2004	John S. Sadowsky	1000-0033	6563

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EXAMINER	
MATIN, NURUL M	

ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/815,097	Applicant(s) SADOWSKY ET AL.
	Examiner Nurul M. Matin	Art Unit 2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8-13,15-22 and 26-33* is/are rejected.

7)☒ Claim(s) *7,14 and 23-25* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *09/02/2005*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see remarks, filed 07/30/2007, with respect to the rejection(s) of claim(s) 1-33 under 102(b) & 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Wikipedia (http://en.wikipedia.org/wiki/fading).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 5-6, 8-10, 13, 26-30, 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al, US 2002/0003773 in view of Wikipedia (http://en.wikipedia.org/wiki/fading (Flat vs. Frequency-selective Fading)).

Re claim 1, Okada discloses an apparatus comprising: a first phase shifter to provide subcarrier dependent phase shifts to modulation symbols associated with an orthogonal frequency division multiplexing (OFDM) signal to generate first phase shifted modulation symbols, wherein said modulation symbols correspond to subcarriers of the OFDM signal (fig.13, page 6, Para [0098] to Para [0099], "The phase shifter 11 receives

as input a complex signal mapped according to a given modulation system such as BPSK, DQPSK, QPSK, 16 QAM or 64 QAM. The signal point of the input complex signal is expressed by (I, Q); and a first inverse discrete Fourier transform unit to convert said first phase shifted modulation symbols from a frequency domain representation to a time domain representation for transmission into a wireless channel (fig.12, page 6, Para [0108] "The IFFT operational circuit 6 performs an operation of inverse Fourier transform collectively on the multiplexed signals of the three channel data as multiplexed by the multiplexer 5 to generate an OFDM signal of the base band of time domain"). But Okada fails to disclose that subcarrier dependent phase shirts are selected to convert a wireless channel displaying flat multipath fading into a wireless channel displaying frequency selective multipath fading. However, Wikipedia (http://en.wikipedia.org/wiki/fading (Flat vs. Frequency-selective Fading)) does teach subcarrier dependent phase shirts are selected to convert a wireless channel displaying flat multipath fading into a wireless channel displaying frequency selective multipath fading (Wikipedia, Flat vs. Frequency-selective Fading, "In a frequency-selective fading channel, since different frequency components of the signal are affected independently, it is highly unlikely that all parts of the signal will be simultaneously affected by a deep fade. Certain modulation schemes such as OFDM and CDMA are well-suited to employing frequency diversity to provide robustness to fading. OFDM divides the wideband signal into many slowly modulated narrowband subcarriers, each exposed to flat fading rather than frequency selective fading. This can be combated by means of error coding. and sometimes simple equalization and adaptive bit loading. Inter-symbol

interference is avoided by introducing a guard interval between the symbols. CDMA uses the Rake receiver to deal with each echo separately").

Therefore, taking the combined teaching of Okada and Wikipedia as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the arrangement of the subcarrier dependent phase shirts are selected to convert a wireless channel displaying flat multipath fading into a wireless channel displaying frequency selective multipath fading as thought in Wikipedia into Okada for avoiding inter-symbol interference.

Re claim 5, Okada and Wikipedia discloses the apparatus of claim 1, Okada also discloses first phase shifter provides a phase Shift to a first modulation symbol I based on a difference between a frequency of a corresponding subcarrier and a center frequency of a channel in which said OFDM symbol is to be transmitted (fig. 13, page 6, para [0099] to [0104]).

Re claim 6, Okada and Wikipedia discloses the apparatus of claim 1, also Wikipedia also discloses that first phase shifter provides subcarrier dependent phase shifts to said modulation symbols based on an approximate coherence bandwidth associated with the apparatus (Flat vs. Frequency-selective Fading).

Re claim 8, Okada discloses acquiring modulation symbols to be used to generate an orthogonal frequency division multiplexing (OFDM) signal, said modulation symbols including at least a first symbol and a second symbol, wherein said modulation symbols correspond to subcarriers of the OFDM signal (fig. 13, page 6, para [0099] to [0104]); applying a first phase shift to said first symbol that is dependant upon the

subcarrier associated with said first symbol to generate a first phase shifted symbol; and applying a second phase shift to said second symbol that is dependent upon the subcarrier associated with said second symbol to generate a second phase shifted symbol(see fig. 13). But Okada fails to disclose that first phase shift and said second phase shift are selected to convert a wireless channel displaying flat multipath fading into a wireless channel displaying frequency selective multipath fading. Wikipedia(http://en.wikipedia.org/wiki/fading)does teach first phase shift and said second phase shift are selected to convert a wireless channel displaying flat multipath fading into a wireless channel displaying frequency selective multipath fading (see Wikipedia, "Flat vs. Frequency-selective Fading").

Therefore, taking the combined teaching of Okada and Wikipedia as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the arrangement of the subcarrier dependent phase shirts are selected to convert a wireless channel displaying flat multipath fading into a wireless channel displaying frequency selective multipath fading as thought in Wikipedia into Okada for avoiding inter-symbol interference.

Re claim 9, Okada and Wikipedia discloses the method of claim 8, and Okada also teaches that applying an inverse discrete Fourier transform to a group of modulation symbols that includes said first phase shifted symbol and said second phase shifted symbol (fig. 12, IFFT (6)).

Re claim 10, Okada and Wikipedia discloses the method of claim 9, and Okada reference also teaches modulation symbols to be used to generate said OFDM signal

include other symbols in addition to said first symbol and said second symbol, said method further comprising applying subcarrier dependent phase shifts to said other symbols to generate other phase shifted symbols, wherein said group of modulation symbols includes said other phase shifted symbols (see claims 1 and 8).

Re claim 13, Okada and Wikipedia discloses the method of claim 8, and Wikipedia also discloses that applying a first phase shift to said first symbol includes applying a phase shift that is related to an approximate coherence bandwidth of a corresponding channel (see Wikipedia (http://en.wikipedia.org/wiki/fading), "Flat vs. Frequency-selective Fading").

Re claim 26, Okada discloses a system comprising: a first phase shifter to provide subcarrier dependent phase shifts to modulation symbols associated with an orthogonal frequency division multiplexing (OFDM) signal to generate first phase shifted modulation symbols, wherein said modulation symbols correspond to subcarriers of the OFDM signal (see claim 1); a first inverse discrete Fourier transform unit to convert said first phase shifted modulation symbols from a frequency domain representation to a time domain representation(see claim 1); and at least one dipole antenna element to transmit a radio frequency (RF) signal that includes said time domain representation of said phase shifted modulation symbols into a wireless channel(fig. 12, antenna(10)). But Okada fails to disclose that subcarrier dependent phase shifts are selected to convert a wireless channel displaying flat multipath fading into a wireless channel displaying frequency selective multipath fading. However, Wikipedia (http://en.wikipedia.org/wiki/fading) does teach subcarrier dependent phase shifts are

selected to convert a wireless channel displaying flat multipath fading into a wireless channel displaying frequency selective multipath fading (see claim 1).

Therefore, taking the combined teaching of Okada and Wikipedia as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the arrangement of the subcarrier dependent phase shirts are selected to convert a wireless channel displaying flat multipath fading into a wireless channel displaying frequency selective multipath fading as thought in Wikipedia into Okada for avoiding inter-symbol interference.

Re claim 27, Okada and Wikipedia discloses the system of claim 26, and Okada reference also teaches a guard interval addition unit to add a guard interval to said time domain representation of said phase shifted modulation symbols (see fig.12, guard interval (7).

Re claim 28, Okada and Wikipedia discloses the system of claim 27, and Okada reference also teaches an RF transmitter located between said guard interval addition unit and said at least one dipole antenna element to generate said RF signal using said time domain representation of said phase shifted modulation symbols (see fig. 12, and orthogonal modulator and frequency converter works as a transmitter).

Re claims 29-30, which claims the same subject matter as recited in claims 8-9. Therefore, claims 29-30 have been analyzed and rejected with respect to claims 8-9.

Re claim 33, which claim the same subject matter as recited in claim 13. Therefore, claim 33 has been analyzed and rejected with respect to claim 13.

4. Claims 15-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Menon et al, US 6940917 in view of Wikipedia (http://en.wikipedia.org/wiki/fading (Flat vs. Frequency-selective Fading)).

Re claim 15, Menon discloses an apparatus comprising: an interleaver to separate a serial input stream of modulation symbols into N spatial streams, where N is a positive integer greater than 1(fig.3, channel interleaver (314), col.12, line 42-45, "the channel interleaver 314 then interleaves the coded bits based on one or more interleaving schemes to provide time, spatial and/or frequency diversity"); and a steering unit to receive said N spatial streams and to steer the associated modulation symbols into M antenna paths, where M is a positive integer greater than 1, wherein said steering unit provides subcarrier dependent phase shifts to modulation symbols associated with at least one of said N spatial streams(fig. 3, steering unit(350), col.13, line 41-60, where it says each beam-steering unit 450 performs beam-steering for an associated subband and also receives the normalized steering vector e(k) for that subband. Within each unit 450, the scaled modulation symbols s.sub.k are provided to N.sub.T multipliers 452a through 452t, one multiplier for each transmit antenna). But Menon fails to disclose that subcarrier dependent phase shifts are selected to convert a wireless channel displaying flat multipath fading into a wireless channel displaying frequency selective multipath fading. However, Wikipedia (http://en.wikipedia.org/wiki/fading does teach subcarrier dependent phase shifts are selected to convert a wireless channel displaying flat multipath fading into a wireless channel displaying frequency selective multipath fading (Wikipedia, Flat vs. Frequency-

selective Fading, "In a frequency-selective fading channel, since different frequency components of the signal are affected independently, it is highly unlikely that all parts of the signal will be simultaneously affected by a deep fade. Certain modulation schemes such as OFDM and CDMA are well-suited to employing frequency diversity to provide robustness to fading. OFDM divides the wideband signal into many slowly modulated narrowband subcarriers, each exposed to flat fading rather than frequency selective fading. This can be combated by means of error coding. and sometimes simple equalization and adaptive bit loading. Inter-symbol interference is avoided by introducing a guard interval between the symbols. CDMA uses the Rake receiver to deal with each echo separately").

Therefore, taking the combined teaching of Menon and Wikipedia as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the arrangement of the subcarrier dependent phase shirts are selected to convert a wireless channel displaying flat multipath fading into a wireless channel displaying frequency selective multipath fading as thought in Wikipedia into Menon for avoiding inter-symbol interference.

Re claim 16, Menon and Wikipedia discloses the apparatus of claim 15, and Menon references also teaches that M antenna paths includes at least a first path and a second path; and said apparatus further includes a first inverse discrete Fourier transform unit within said first path and a second inverse discrete Fourier transform unit within said second path (fig.4, col.14, line 8-26, which shows that each Fourier transform is connected with the antenna").

Re claim 17, Menon and Wikipedia disclose the apparatus of claim 15, and Menon reference also teaches that first and second inverse discrete Fourier transform units are fast Fourier transform units (see fig.3 for FFT).

Re claim 18, Menon and Wikipedia discloses the apparatus of claim 15, and Menon reference also teaches that N equals M (see fig.3 and fig.4).

Re claim 19, Menon and Wikipedia disclose the apparatus of claim 15, and Menon reference also teaches that N does not equal M (see fig. 3 and fig.4).

Re claim 20, Menon and Wikipedia disclose the apparatus of claim 15, and Menon reference also teaches that an apparatus is adapted for use within a multiple input multiple output (MIMO) based transmitting device (col.11, line. 56-58).

Re claim 21, Menon and Wikipedia discloses the apparatus of claim 15, and Menon reference also teaches a mapper to map input data bits into a serial stream of modulation symbols based on a predetermined modulation scheme, said serial stream of modulation symbols for delivery to an input of said interleaver (fig. 3, "it shows that output of the symbol mapping (316) is going to the multiplexer (360) which is used to refer to the interleaving of digital signal data").

Re claim 22, Menon and Wikipedia discloses the apparatus of claim 21, and Menon reference also teaches that a forward error correction (FEC) coder to encode user data based on a predetermined error code, said FEC coder to deliver encoded data bits to an input of said mapper (fig.3 shows the encoder (312) which codes the traffic data (the information bit) in accordance with one or more coding schemes to provide coded bits).

5. Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al, US 2002/0003773, Wikipedia (http://en.wikipedia.org/wiki/fading (Flat vs. Frequency-selective Fading)) and in view of Li et al, US 7020072.

Re claim 2, Okada and Wikipedia discloses the apparatus of claim 1, Okada reference also disclosese a second phase shifter to provide subcarrier dependent phase shifts to said modulation symbols associated with said OFDM signal to generate second phase shifted modulation symbols, wherein said second phase shifter provides different subcarrier dependent phase shifts to said modulation symbols than said first phase shifter (fig, 13, page 6, para [0099] to [0104]). But Okada and Wikipedia fail to teach that a second inverse discrete Fourier transform unit to convert said second phase shifted modulation symbols from a frequency domain representation to a time domain representation; Where in said first inverse discrete Fourier transform unit is associated with a first antenna path and said second inverse discrete Fourier transform unit is associated with a second antenna path. However, Li does teach a second inverse discrete Fourier transform unit to convert said second phase shifted modulation symbols from a frequency domain representation to a time domain representation; Where in said first inverse discrete Fourier transform unit is associated with a first antenna path and said second inverse discrete Fourier transform unit is associated with a second antenna path (fig. 5, col.7, line 38 to col.8, line 49).

Therefore, taking the combined teaching of Okada, Wikipedia and Li as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the

arrangement of a second inverse discrete Fourier transform unit to convert said second phase shifted modulation symbols from a frequency domain representation to a time domain representation; Where in said first inverse discrete Fourier transform unit is associated with a first antenna path and said second inverse discrete Fourier transform unit is associated with a second antenna path as thought in Li into Okada and Wikipedia for overcoming the frequency- selective fading channels by employing a system including orthogonal frequency division multiplexing (OFDM) in combination with an at least two antenna transmit diversity arrangement.

Re claim 3, Okada, Wikipedia and Li references teach the apparatus of claim 2, further comprising: and Okada reference also teaches at least one other phase shifter to provide subcarrier dependent phase shifts to said modulation symbols associated with said OFDM signal to generate other phase shifted modulation symbols, wherein said at least one other phase shifter provides different subcarrier dependent phase shifts to said modulation symbols than said first and second phase shifters (fig.13, page 6, Para [0099] to [0104]). And also Li reference also teaches at least one other inverse discrete Fourier transform unit to convert said other phase shifted modulation symbols from a frequency domain representation to a time domain representation (fig.5, col.7, line 38 to col.8, line 49).

Re claim 4, Okada, Wikipedia and Li references teach the apparatus of claim 2, and Okada reference also teaches first and second inverse discrete Fourier transform units are fast Fourier transform (FFT) units (see fig. 16).

6. Claims 11 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al, US 2002/0003773, Wikipedia and in view of Daudelin, US 4716376.

Re claim 11, Okada and Wikipedia discloses the mothod of claim 8, and Okada reference also teaches a first phase shift to said first symbol includes applying a phase shift that is linearly related to a frequency of the subcarrier associated with said first symbol (fig. 12). But Okada and Wikipedia fail to disclose that phase shift is linearly related to a frequency. However, Daudelin does (col.6, line 34-37, "The phase shift imposed by this circuit on a given frequency component is linearly related to the frequency of that component").

Therefore, taking the combined teaching of Okada, Wikipedia and Daudelin as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the arrangement of phase shift is linearly related to a frequency as thought in Daudelin into Okada and Wikipedia for the same relative effect on any two frequencies F1 and F2 separated in frequency by a fixed difference.

Re claim 31, which claim the same subject matter as recited in claim 11. Therefore, claim 31 has been analyzed and rejected with respect to claim 11.

7. Claims 12 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al, US 2002/0003773 and in view of Kumagai et al, US 5796307.

Re claim 12, Okada and Wikipedia discloses the method of claim 8, and Okada reference also teaches a first phase shift to said first symbol includes applying a phase shift that is non-linearly related to a frequency of the subcarrier associated with said first

symbol (see fig.12). But Okada and Wikipedia fail to disclose that phase shift is non-linearly related to a frequency. However, Kumagai does (col.4, line 32-34," The phase shift amounts of the first and second phase shifter means 21 and 23 vary nonlinearly with respect to frequency").

Therefore, taking the combined teaching of Okada, Wikipedia and Kumagai as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the arrangement of that phase shift is non-linearly related to a frequency as thought in Kumagai into Okada and Wikipedia to obtaining an amplified output signal from the second phase shifter (summery of the invention).

Re claim 32, which claim the same subject matter asrecited in claim 12. Therefore, claim 32 has been analyzed and rejected with respect to claim 12.

Allowable Subject Matter

8. Claims 7, 14, 23-25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nurul M. Matin whose telephone number is 571-270-1188. The examiner can normally be reached on mon-fri (7:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Nurul Matin
Examiner.

MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER